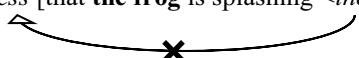# Topichood and the Comprehension of Relative Clauses in French

Anamaria Bentea and Stephanie Durrleman

1. Introduction

Children's difficulties with object relative (OR) clauses as compared to subject relative (SR) clauses have been explained in terms of intervention effects, arising in ORs when the object and the subject share a (lexical) NP feature (Adani 2011; Belletti 2014; Belletti & Guasti 2015; Bentea 2016; Bentea, Durrleman & Rizzi 2016; Friedmann, Belletti & Rizzi 2009; a.o.). The gist of this proposal is that it is harder for children to assign the proper thematic roles to noun phrases in structures like (1) which involve movement of a lexically-restricted object (meaning a sequence such as '*the + NP*') from its canonical position as complement of the verb to the beginning of the sentence[1], while crossing a preverbal subject also containing a lexical restriction (i.e. +NP):

<div align="center">+R +NP   +NP   <+R +NP></div>

1.   Show me *the princess* [that **the frog** is splashing *<the princess>*].

The similarity in lexical NP restriction between the head of the OR (*the princess*) and the intervening subject (*the frog*) is responsible for triggering intervention effects in child grammar, which are reminiscent of intervention effects found in adult grammar (Friedmann et al., 2009) and can be theoretically subsumed by the locality principle of Relativized Minimality (RM) (Rizzi 1990, 2004, 2013; Starke 2001). More specifically, in a configuration such as (2), the dependency between X (the target) and Y (the origin) cannot hold if Z structurally intervenes between X and Y and shares relevant morphosyntactic features with X, where relevant morphosyntactic features[2] are features that trigger syntactic movement.

2.   *X … **Z** …Y*

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[1] Within syntactic theory, such dependencies are called object A-bar chains.

[2] Rizzi (2004) distinguishes between specific sets of morphosyntactic features: *Argumental* features {person, number, gender, case}*, Quantificational* features {WH, focus, ...}*,* and *Modificational* features {evaluative, epistemic, ...}, as well as *Topics*, which he treats as a separate category.

Based on the featural specification of the target X and the intervener Z, RM postulates three types of relations that can hold between X and Z, summarised in (3), where A and B represent abstract morphosyntactic features (Rizzi 2004, Friedmann et al. 2009):

3.   X   **Z**   Y
      a.   <+A>   ...   +**A**   ...   <+A>   (identity)
      b.   <+A,B> ...   +**A**   ...   <+A,B> (inclusion)
      c.   <+A>   ...   +**B**   ...   <+A>   (disjunction)

An identity relation (3a) between the features of the target X and the intervener Z leads to ungrammatical sentences, as in cases where there is an overlap of the WH feature on both a moved wh-object *who* and an intervening subject (e.g. **Who do you wonder who is splashing?*). In contrast, a disjunction relation (3c) between X and Z is unproblematic for RM (e.g. *Which princess do you think he is splashing?*). RM holds similarly in adult and child grammar for cases of featural identity (3a) and featural disjunction (3c), however they differ for inclusion (3b) (Friedmann et al. 2009) as exemplified in (1). Lexically-restricted ORs are inaccessible for children because of the mere overlap of a lexical +NP feature both on the OR head and on the intervening subject (yielding a superset-subset configuration), although these structures are accessible for adults because there is a difference between the head of the OR (*the princess*) and the intervening subject (*the frog*) in the scope-discourse (or 'criterial') feature +R, attracting the head of the relative clause.

    Such intervention effects can be modulated by featural mismatches in argumental or Phi features between the two noun phrases, but not all features are created equal. For Italian-speaking children, a mismatch in number between a lexically-restricted object RC head and an intervening lexical subject significantly facilitates comprehension, while a mismatch in gender does not (Adani, van der Lely, Forgiarini, & Guasti 2010). However a gender mismatch between an object RC head and an intervening lexical subject sharply improves comprehension of ORs for Hebrew-speaking children (Belletti, Friedmann, Brunato & Rizzi 2012). The observed differences appear related to whether or not the verb agrees for the feature in question: the verb in Italian (4a) agrees in number with the subject, while it does not agree in gender. In contrast with Italian, the verb in Hebrew overtly agrees in gender with the subject (see 4b where the verb *draws* is marked masculine since the doctor drawing is male).

4.   a. disegna   (Italian)
          draws
       b. she-mecayer   (Hebrew)
          that-draws-Masc

In light of these observations, Belletti et al. (2012) suggest that the features which can modulate intervention locality are those syntactically 'active' in a

given language, meaning features that function as attractors for movement by belonging to the feature set of the clausal inflectional head. They further elaborate their account based on the fact that Hebrew-speaking children do not perform better with object *which*-questions involving a Case mismatch between the head and the intervener (Friedmann, Rizzi & Belletti 2017). Friedmann et al. (2017) conclude that Case, while relevant for movement, is not a property of the attracting head, and thus is not a relevant feature for modulating intervention locality. Thus Friedmann et al. (2017) argue that only features acting as attractors of phrasal movement can be used to overcome locality violations. The authors list argumental or phi-features like gender and number, as well as quantificational features like WH, among the features attracting phrasal movement and taken into account in the computation of RM.

The question that we address in this study is whether a mismatch in a feature that is neither argumental, nor quantificational in nature such as Topic (Rizzi 2004, see footnote 2) impacts OR comprehension. The presence of a Topic feature on the moved argument distinguishing it from the intervener has been argued to improve children's comprehension of verbal passives in English, even for non-actional verbs (Snyder & Hyams 2015). Citing results from comprehension studies (O'Brien, Grolla & Lillo-Martin 2006) and elicited production studies (Pinker, Lebeaux & Frost 1987), Snyder & Hyams argue that English-speaking children find passives easier to comprehend and produce when discourse contexts establish a distinction in the Topic feature between the fronted patient and the intervening agent.

Discourse factors, and topichood in particular, have been claimed to greatly reduce the difficulty associated with the processing of object relatives in adults (Mak, Vonk & Schriefers 2002, 2006, 2008). Mak et al.'s account starts from the idea that the discourse status of referents affects the processing of relative clauses and proposes that the choice of subject in a clause also depends on topichood. That is, the most topicworthy entity in the relative clause will be chosen as the syntactic subject. Since relative clauses are statements about the antecedent, the referent of the antecedent is always the topic of the relative clause. Topichood and subjecthood are thus made to coincide in relative clauses, the default interpretation being that the relative pronoun is also the subject of the relative clause, which leads to processing difficulties in the case of object relatives. Going beyond the sentence level, Mak et al. (2008) predict that an entity established as the discourse topic by the preceding context should be more topicworthy and therefore more likely to be interpreted as the subject of the relative clause. This should alleviate processing difficulties with ORs in instances where the NP internal to the relative clause is the discourse topic, as compared with when it is not. Mak et al. (2008) tested these predictions in reading time experiments controlling for the presence of a context defining the referent of the relative clause internal noun as the discourse topic. They found that the asymmetry in the processing of SRs and ORs disappeared when the subject of the relative clause was established as discourse topic by the preceding context.

Taking these findings into consideration, our study examines whether (i) +Topic is a relevant feature for modulating intervention effects in object relatives in children and whether (ii) topichood (that is, the topicworthiness of an element as discourse topic, which would tend to signal it out as the subject, Mak et al. 2008) is relevant for modulating children's comprehension difficulties with object relatives.

2. Participants

A group of French-speaking children (N = 103, ranging in age from 5;0 to 7;9, MA = 6;5, SD = 10 in months) participated in the study. They had no diagnosed language or speech disorders and were recruited from various schools in Geneva, Switzerland.

3. Method and materials

Participants took part in four experiments that used a character-selection task[3]: children were presented with two pictures illustrating the same action but with reversed thematic roles, as shown in figure 1, and had to point to the correct character identified by a relative clause.
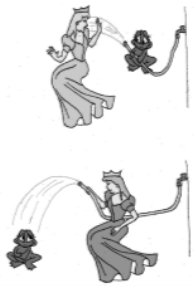
Figure 1. Example of pictures associated with the test sentences

The pictures depicted nine actional verbs (*arroser* 'splash', *coiffer* 'comb', *couvrir* 'cover', *laver* 'wash', *mordre* 'bite', *photographier* 'photograph', *pousser* 'push', *suivre* 'follow', *taper* 'hit'). The referents were all animate (either humans or animals) and matched in gender and number. All experiments used the same pictures and the same test sentences and included a total of fourteen items, seven subject relatives and seven object relatives, of the type exemplified in (5) and (6) below:

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[3] The pictures were adapted from images provided by Candice Coyer.

5. *Subject relative clause (SR)*
    Montre-moi le garçon qui   couvre l'éléphant.
    show-me   the boy   QUI covers the elephant
    'Show me the boy that is covering the elephant.'

6. *Object relative clause (OR)*
    Montre-moi la princesse   que   la grenouille arrose.
    Show-me   the princess QUE the frog   splashes
    'Show me the princess that the frog is splashing.'

The only difference across the four studies consisted in the way in which the test sentences were introduced, as each study was associated with a particular Topic condition. The type of structure tested (SR vs OR) was a within-subject variable, while the Topic condition was a between-subject variable. *Experiment (Exp) 1* only included *No Topic* instances and therefore children were presented with a picture like the one illustrated in figure 1 above and then asked to point to the correct character identified by a relative clause as in (6) '*Show me the princess that the frog is splashing*'. While no lead-in was provided in Exp 1, all of the other three studies used a short introduction before the actual test sentence, with the purpose of establishing either the head of the relative clause or the noun internal to the relative clause as the discourse topic, thus triggering the presence of a distinctive +Topic feature on one of these two constituents. Every lead-in was paired with an image of the topicalised referents. Below are examples of the three different types of lead-in associated with the picture in figure 1 and the OR in (6) above.

7. *Topic RC Head condition (Exp 2)*
    Voilà deux princesses. Les princesses aiment beaucoup l'eau. Voyons ce qui se passe avec les princesses. Tu dois faire attention et me montrer une seule. Écoute-bien.
    'Here are two princesses. The princesses like water a lot. Let's see what's happening with the princesses. You have to pay attention and show me only one. Listen carefully.'

8. *Topic Patient condition (Exp 3)*
    Voilà deux princesses. Quelque chose va arriver à l'une d'entre elles. Tu dois faire attention et me montrer une seule. Écoute-bien.
    'Here are two princesses. Something is going to happen to one of them. You have to pay attention and show me only one. Listen carefully.'

9. *Topic RC-Internal NP condition (Exp 4)*
    Voilà une grenouille. La grenouille aime bien l'eau. Voyons ce qui se passe.
    'Here is a frog. The frog loves water a lot. Let's see what's happening.'

The preceding context in Exp 3 (example 8) also associated the character established as the discourse topic to the role of Patient and hence gave further indication of the argumental role of the head noun. This specific formulation of the lead-in was meant to mimic the Topic condition used in the Pinker et al.'s (1987) elicited production study on passives (cited by Snyder and Hyams 2015), in which the element that had been established as the discourse topic had also been associated with the role of patient. Exp 4 established the noun internal to the relative clause as the discourse topic, along the lines of Mak et al.'s (2006, 2008) studies with Dutch-speaking adults.

4. Predictions

If a feature such as [+Topic] modulates intervention effects in OR comprehension in children, then those object relatives containing a mismatch in this particular feature should yield better comprehension scores than those in which the subject and the object DP do not bear such a feature (ORs in Experiments 2 - 4). Moreover, we would also expect that the difference in performance between SR and OR would be reduced in the cases of a mismatch in the Topic feature.

If topichood, as defined by Mak et al (2006, 2008), is relevant for alleviating children's difficulties with OR comprehension, then we expect a different pattern of performance among the four cases tested. Children should only find ORs with a topicalised subject (Exp 4) easier to comprehend because in these cases the referent of the subject internal to the RC is more topicworthy than the referent of the RC antecedent or head. If the difference in topicworthiness between the RC head and the RC-internal NP drives the assignment of the subject role, such that the NP with the most topicworthy referent will be interpreted as the subject of the relative clause, then children should be less likely to interpret the head of an OR as the subject of the action described by the relative clause. Under the topichood hypothesis, comprehension difficulties should arise not only in the No Topic condition (Exp 1), but also in the conditions where the RC head has been established as the discourse topic (Exp 2 - 3). In these instances, children should interpret the RC antecedent as its subject and therefore should be more prone to assigning a subject RC interpretation to the structure.
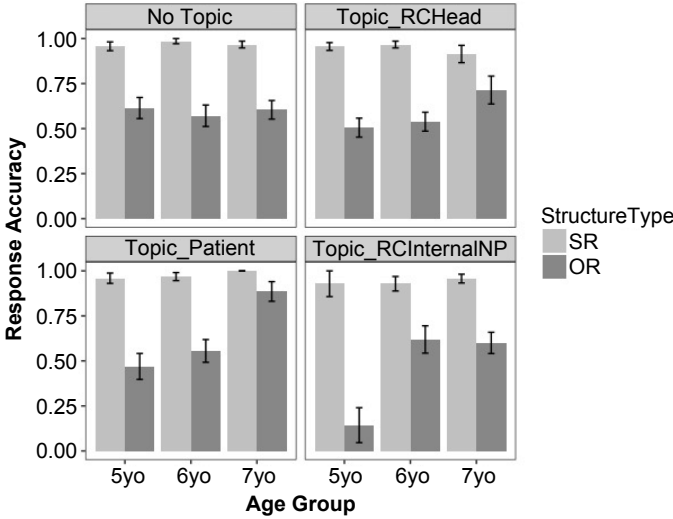
5. Results

The four studies yielded a total of 1442 responses from children. Half of the responses corresponded to subject relative clauses and the other half to object relative clauses. An answer was coded as accurate only if children pointed to the correct character of the action described by the relative clause. Figure 2 plots the proportion of accurate responses obtained for the Topic conditions (across the four studies) for all the age groups tested. The bars represent the standard error.
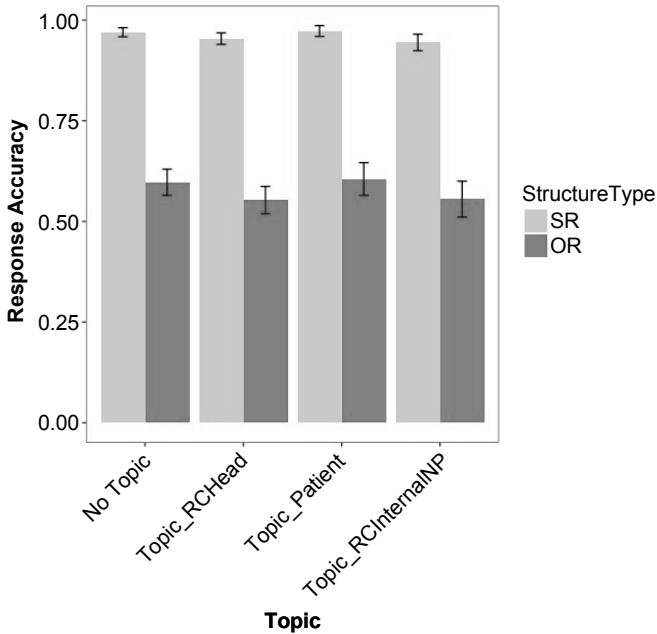
Figure 2. Mean response accuracy for all studies by type of structure (SR vs. OR) and Topic condition (No Topic, Topic_RCHead, Topic_Patient and Topic_RCInternalNP)

The overall results revealed a clear-cut subject-object asymmetry in children's comprehension of relative clauses and no difference in performance between the various Topic conditions tested in the four studies. The picture, however, is slightly different when we zoom in on the results obtained for each age group tested.

Figure 3. Mean response accuracy for SR and OR within each age group in the four Topic conditions (No Topic, Topic_RCHead, Topic_Patient and Topic_RCInternalNP)

The results by age group show that the 7-year-old-group performed better than the 5-year-old and the 6-year-old groups with ORs in which the head of the relative was introduced as the discourse topic (Topic_RCHead) and with ORs for which the preceding context also included an added indication of the corresponding argument role. The 5-year-old group had the most difficulties comprehending ORs for which the preceding context established the RC internal subject as the discourse topic, as exemplified in (9) above.

We fit a generalized linear mixed model to our data, using the lme4 package (version 1.1-10; Bates, Maechler, Bolker, & Walker 2015) in the R environment (R Development Core Team 2015), specifying the optimizer 'bobyqa'. Response accuracy was the categorical dependent variable. The model included Structure Type (SR vs OR) and Topic (NoTopic vs Topic_RCHead vs Topic_Patient vs Topic_RCInternalNP) as fixed factors, the centered Age as covariate and Subject and Item as random effects. Models with a more complex random structure failed to converge, as did models with a three-way interaction between Structure Type, Topic and Age. Each level of the factors Structure Type (SR-OR) and Topic (NoTopic-Topic_RCHead-Topic_Patient-Topic_RCInternalNP) was compared to the following level (in the order given in brackets).

The statistical analysis revealed a main effect of Structure Type (coef = -3.39, $SE = 0.29$, $z = -11.45$, $p < 0.001$). Overall, response accuracy for OR was significantly lower than response accuracy for SRs. The analysis also demonstrated a main effect of Age (coef = 0.03, $SE = 0.01$, $z = 2.59$, $p < 0.01$), showing that overall response accuracy increased with age.
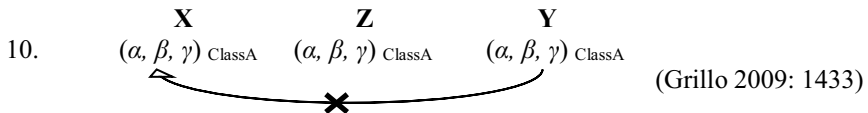
6. Discussion

In a series of four experiments we explored whether the presence of a discourse-related feature like +Topic either on the moved argument or on the intervening subject modulates intervention effects associated with the comprehension of object relatives in children. We triggered the presence of the +Topic feature by introducing either the referent of the relative clause head (Exp 2 and Exp 3) or the referent of the RC internal noun (Exp 4) in a preceding context, which allowed us to establish either one of the two constituents as the discourse topic.

Our results confirm the well-known difficulty that children experience with lexically-restricted ORs: while children comprehended SRs very well, they were less accurate when the head of the OR and the intervening subject contained an overlapping +NP feature, i.e. yielding an inclusion relation which, according to the RM account, is difficult for immature systems to compute. An easier, intersection relation, according to this account, should obtain in instances of a mismatch in features between the lexically restricted head and intervener, once these features act as attractors for phrasal movement (Friedmann et al. 2017). However the studies to date reporting a facilitating effect have examined argumental or quantificational features and here we explored mismatches in a feature which is neither, namely the discourse feature Topic. If this feature were taken into account in order to overcome the difficulty caused by the intervention of a lexically-restricted +NP subject, we would expect better comprehension in cases of a Topic mismatch between the head noun and the intervener. However, children showed low comprehension scores with these structures as well, i.e. the mismatch in the Topic feature did not give rise to the ameliorating effects associated with an intersection relation. Rather, in these cases, the featural specification of the object and the subject creates an inclusion relation, due to the presence of a +NP feature on both elements. Topic is thus invisible for the computation of locality by French-speaking children.

The data also indicate that difficulties with OR comprehension in children are not alleviated in instances where the noun with the most topicworthy referent is associated with the +Topic feature, as we did not observe improvements in children's response accuracy between those ORs in which the referent of the noun internal to the relative clause was the discourse topic (and therefore more topicworthy than the antecedent) and the reverse case where the referent of the relative clause head was the discourse topic and potentially more topicworthy than the noun internal to the relative clause. Children, contrary to adults (see Mak et al. 2006, 2008), do not seem to associate topichood to subjecthood, that is, they do not interpret the more topicworthy element as the subject, which should prevent them from assigning a subject interpretation to the head of an object relative clause.

That children cannot draw on the mismatch in the +Topic feature strikes a parallelism with structures involving a mismatch in a quantificational feature

like +Wh, i.e. lexically-restricted questions such as *which princess is the frog splashing?*. In fact, even in the absence of a +Topic feature on the relative clause head, this element is still distinguished from the intervener through the presence of a +R (that is +Relative) feature, which does not suffice to improve performance either (Friedman et al. 2009; Grillo 2008, 2009). This is in line with Grillo's (2008, 2009) proposal that a minimality effect is expected to arise in non-local dependencies involving movement over an intervening element when the feature structures of the moved object and of the intervening subject are not distinguishable (the features of the intervener and the displaced object belong to the same class – Argumental, Quantificational, Modifier, Topic). More specifically, in order to distinguish between a moved DP and an intervening DP, it is necessary to represent the whole array of features associated with the two elements.

$$
\begin{array}{ccc}
\textbf{X} & \textbf{Z} & \textbf{Y} \\
(\alpha,\ \beta,\ \gamma)\ \text{ClassA} & (\alpha,\ \beta,\ \gamma)\ \text{ClassA} & (\alpha,\ \beta,\ \gamma)\ \text{ClassA}
\end{array}
$$

10.   (Grillo 2009: 1433)

The processing cost of activating, selecting, maintaining, and manipulating all the morphosyntactic features required to distinguish the intervening subject from the moved object might be too high to pay for populations with more limited processing resources (such as agrammatics and younger children, for example). In such cases the representation of scope-discourse related features is compromised (Grillo, 2009), thus leading to comprehension difficulties.

Indeed, sensitivity to discourse related features (i.e. Topic) increases with age, as evidenced in our data by the fact that the children in the seven-year-old group give more accurate responses for object relatives in which the OR head noun was introduced as the discourse topic than in cases where it did not bear a distinctive +Topic feature. Moreover, the subject-object asymmetry is greatly reduced in the seven-year-old group when the preceding context gave further indication of the argumental role of the head noun. Older children seem to be more sensitive to information indicating the argument role played by the OR head. Young children, on the other hand, have more difficulties integrating different sources of information from the discourse context. They struggle with the comprehension of structures that display a non-canonical word order when the only feature distinguishing the moved argument from the intervening one is a scope-discourse feature, even in cases where there is an indication of the thematic role of the moved argument. The features which serve to facilitate parsing non-canonical structures, beyond attracting phrasal movement, appear to need to be active argumental features on the attracting head (Friedman et al. 2017).

7. Conclusion

With this study, we explored French-speaking children's comprehension of locality configurations involving mismatches in a feature attracting phrasal movement while being neither argumental nor quantification, i.e. the discourse feature +Topic. Our experimental evaluation of the comprehension of SRs and ORs with and without a Topic mismatch shows that the presence of a discourse-related feature like +Topic on the head noun in ORs does not modulate comprehension, in line with what has already been observed for other non-argumental features such as +Wh and +R (Friedmann et al. 2009). This does not improve in instances when the context associated the head of the relative to the role of Patient (Snyder & Hyams 2015), or when the most topicworthy element, i.e. the subject, is associated with the +Topic feature (Mak et al. 2008). Young children seem instead to be unable to capitalize on any of these factors to overcome the presence of an NP feature on the moved object and the intervener. The features that most clearly modulate comprehension of non-canonical structures such as ORs are those involving mismatches in argumental features realized on the clausal inflectional head (Belletti et al. 2012, Friedmann et al. 2009, 2017).

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